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Behavioral studies of listening in children with both normal and exceptional hearing are presented. The conjugate of assessing listening is discussed. This method provides a continuous record of ongoing behavior allowing for observation of moment-to-moment changes in listening. It determines how sustained, how strong, and how continuous a child's attention is to a visual and/or auditory stimulus. Results reported from studies of children with normal hearing revealed that listening was not naturally and automatically carried out. Studies of five children with hearing impairment revealed that residual hearing and listening training was no guarantee that the child would consistently make use of his listening ability. Tables showing the performance of these five children are included. (RT)

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FROM A PSYCHOLOGIST'S POINT OF VIEW

Paper presented by Mary Mira at 46th Annual Convention
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AUDITORY ASSESSMENT OF CHILDREN

FROM A PSYCHOLOGIST'S POINT OF VIEW

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Each of the professions represented here is concerned in some way with childrens' listening. Psychologists have studied it a number of ways, most traditionally perhaps by examining the effects of hearing loss on test or criterion task performance. A more recent approach is to treat listening as a behavior and study it directly. By doing so we have been able to refute the commonly held assumption, which is implicit in our educational management of children, that listening is a behavior which is carried out naturally and automatically by all normal hearing children; that it never occurs in those with no hearing; and among those hearing impaired with residual hearing, it is carried out most intensively by those who have had the most training in using their hearing.

Just as it has been shown that turning the head and aiming the eyes is neither equivalent to nor sufficient evidence for looking, so we have demonstrated that sitting quietly under headphones with sound issuing forth is no guarantee that listening is occurring.

We have been experimentally analyzing listening in normal and exceptional children in a way that gives us information about childrens' auditory functioning that we have not been able to obtain in other ways. I would like to present the method we are using to directly measure one corner of listening behavior and to briefly discuss some of the results.

If a child is given the mechanical means, such as a handswitch, by which to directly and immediately control the intensity of a continuously available stimulus, how hard he works to maintain the stimulus is an index of its consequential value to him and how long he works to observe it tells us about his attention span for that stimulus. We can program a variety of stimuli, both auditory and visual, through a conjugate servo, which is an electromechanical programmer which varies the intensity of a stimulus as a direct function of the child's response rate one handswitch. Each conjugate programmer can be set to (1) increase the intensity of a stimulus from zero to a predetermined maximum when the child maintains a certain response rate on a switch; (2) decrease the intensity of a stimulus from its maximum to zero when the child works on the switch, so that he must refrain from responding in order to observe the stimulus; or (3) program the ongoing stimulus freely whether the child presses the switch or not.

Since, in a conjugate arrangement of consequences, the child must maintain some rate of responding to directly control intensity, we have a means of directly determining how sustained, how strong, and how continuous is his attention to that stimulus. This method lends itself admirably to the study of listening. It is the only way to program ongoing narrative stimuli and thus be able to measure continuous attention.

The conjugate can be used to control the brightness of an image on a television moniter, the intensity of any auditory event coming via headphones or speaker, the brightness of the room lights, or the intensity of the audio and video channels of a movie projector. The consequential events that we

have found most useful with the age group we are studying have been audio and visual narrations--films or television programs. Under a conjugate arrangement the narration continues whether or not the child works to tune it in. If he stops responding, that portion of the narration that is presented at zero intensity is lost to him.

The children are placed in the experimental room individually, told only that they can watch a movie, given the handswitches and headphones, and left alone. A demonstration of the handswitches is given if necessary. For the hearing impaired children, comfort levels for the audio channel are established ahead of time. The rate at which a child must work to maintain the narration at maximum intensity is individually determined for each child.

Conjugate assessment of listening differs from the usual methods used by psychology in that it provides a direct rather than indirect measures of behavior. For example, to study whether a subject attends best to learning material presented auditorally or visually we traditionally present him a list of stimuli via each channel and then go back and see which list he learned best. The problem with this method is that a low score does not tell us if the subject has a response deficit, a recall problem, or if he detuned while the material was presented.

Our methods are similar to those of audiology in that we are both concerned with some aspect of the child's auditory functioning and we both study it by interjecting an observable response that can be reliably recorded, but the conjugate method of studying listening is different from audiology and certainly cannot substitute for it. First, audiology is concerned with precise specification of the stimulus and the child's response to the stimulus, whereas the conjugate

method records responses to obtain a consequence. Secondly, the conjugate method method provides a continuous record of ongoing behavior, rather than a record of discrete responses, allowing for observation of moment-to-moment changes in listening. A third way in which direct measurement of listening differs from traditional audiological procedures is that in the conjugate method the consequences which control the child's behavior are continuously available, rather than discrete (or even unspecified).

The conjugate method has been used successfully with infants, preschoolers, and retardates.

Let me briefly mention what we have found among children with <u>normal</u> hearing. Frist, normal elementary school children, when given the chance to work to look, listen, or do both, prefer a combined audio and video narration. They work at high rates for an hour or more and maintain continuous attention to the narration. When they must choose to look or to listen, but not both, they prefer to follow a narration visually rather than auditorally. We have never found a child who would rather listen than look.

We have also found several types of listening deficit among children with normal hearing. Some children will never work to listen. They do not press the switch to drive audio away--they just do not respond for it in any way. These children will work for an hour to attend to a video narration, so the problem is not one of general attention or of inability to understand the experimental contingencies. Each of the normal hearing nonlisteners has been found in a special class, usually for the learning disabled, and many of them have marked speech deviations.

Another type of listening deficit in normal hearing children is that in which the children will work at high rates and perform complex discrimination and differentiations in order to attend to the video portion of the narration, but who work only sporadically or intermittently in order to listen. Many of these children have been in classes for the learning disabled and have been described as having a "short attention span". The records obtained in the laboratory indicate that the attention problem relates solely to auditory attention. Again, we have not yet found a child who will maintain attention to the audio narration and occasionally detune visually.

Thus, the first part of the assumption, that listening can be expected when hearing is normal, does not prove true.

The hearing impaired subjects which we have studied to date have been children from a preschool for hearing impaired. They were hard of hearing, scored at least average on intelligence tests, and have had one to two years of school and daily experience going into a tutoring room and sitting across an auditory training unit from their teacher. I would like to individually discuss the five children who have been studied most extensively, to demonstrate that the conjugate method is sensitive to individual listening patterns.

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Figure 1

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Mike, age 5-5, is rated by all three of his teachers as the best speech-reader of the group; one teacher rated him as the best listener and the other two as the second best listener of the five. He has the best speech of the five. When he was given the chance to work on one handswitch to look while

simultaneously working on another in order to listen, he chose to do both. He responded throughout all of the sessions to maintain both channels at maximum intensity. When the video channel was available free, he worked and stopped appropriately in order to add the audio channel. He was the only child of this sample who showed sustained and continuous listening while the video channel was also available.

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Figure 2
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One other child, Cathy, age 6-4, also worked and stopped with both hands to obtain the audio and video channels simultaneously; and she worked to add audio to the free video channel, but she occasionally stopped working to listen while she continued to work to look. Cathy was rated third out of the five in speech reading by all three teachers, but there was no agreement on her listening ability--one teacher rated her the highest, one the lowest, and the other as third in listening.

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Figure 3
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A third child, Sheryl, age 6-0, emitted many superstitious responses. When given the chance to listen rather than do nothing, she worked and stopped to listen to music, but the topography of her pressing was somewhat different. On another occasion she pressed the left handswitch no matter what its effect; on another date she pressed both switches at a high rate incontingent of the effect on the narration. She was rated as second highest in speech reading by her teachers and second or third of the five in listening.

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Figure 4
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Joy, age 5-8, was rated fourth out of five in listening by all three teachers; two of them rated her next to the worst in speech reading, and one rated her the lowest. She demonstrated good attention to the video portion of the narration. On one occasion she worked briefly to add audio to a free video channel, but did not maintain her listening responses. She never pressed to drive audio away, except when doing so gave her the chance to watch, that is, when she could work on one switch to look or stop working to listen but not both.

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Figure 5
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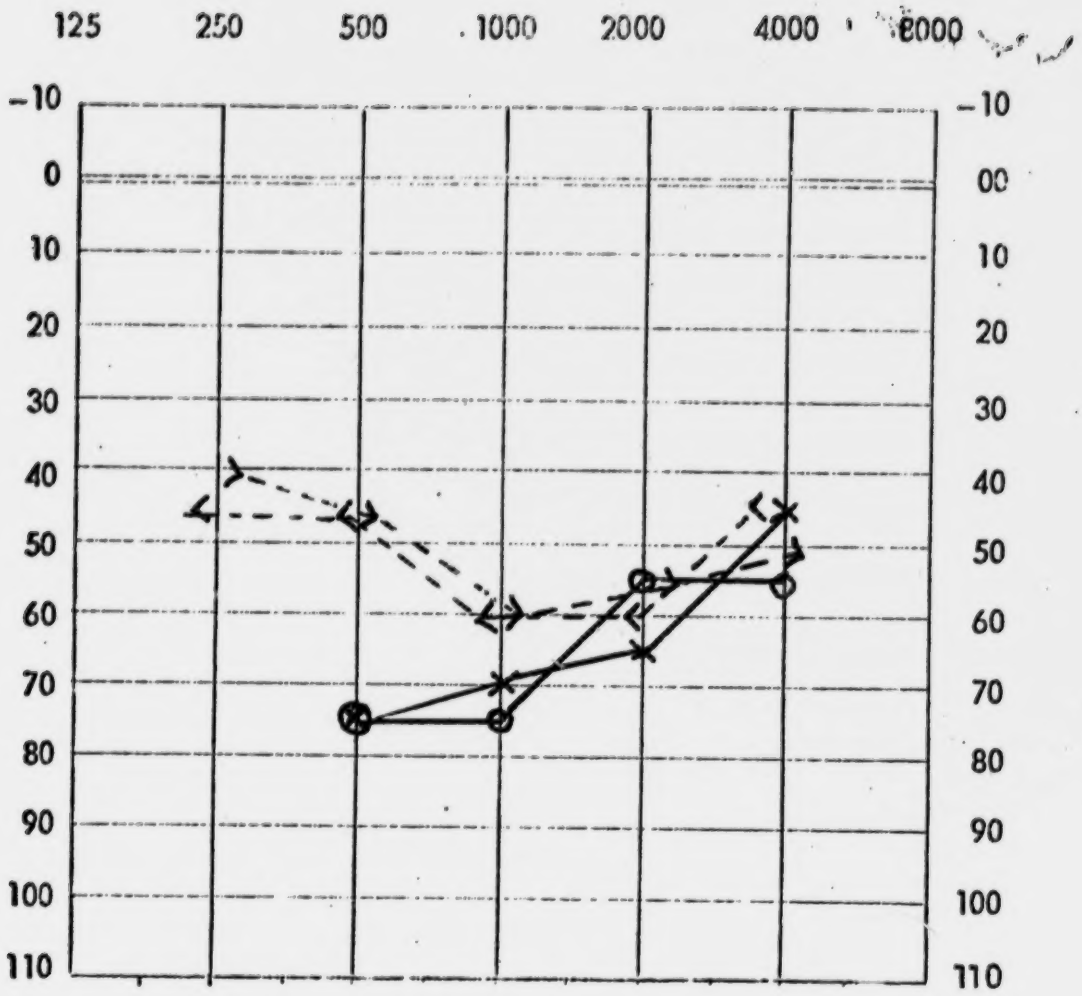
The fifth child, Paul, age 6-3, is the problem child. He has had the most training, but the teachers report that his communication skills have deteriorated. He is rated the lowest in speech reading by two teachers and second lowest by one; two of his teachers rated him worst in listening and one rated him the best. Paul worked contingently to watch the narration and worked and stopped contingently to add audio to freely programmed video. However, he never worked at a rate high enough to maintain a continuous auditory narration at full intensity, but worked at a low rate to keep turning the audio on. It was not simply the change in intensity that was consequential for him since he did stop working completely to keep audio at full intensity when the programmer was set to diminish intensity upon responding.

In summary, two of the five hard of hearing children looked and listened simultaneously and maintained fairly continuous and sustained attention; one

of the two worked harder and more continuously to listen. He was consistently rate rated high in speech reading and listening by his teachers. One child pressed the handswitch incontingently; one never worked to listen and was rated low in listening and speech reading by the teachers. The fifth child watched continuously but listened intermittently. There was disagreement among the teachers about his listening ability but all viewed him as one of the worst speech readers.

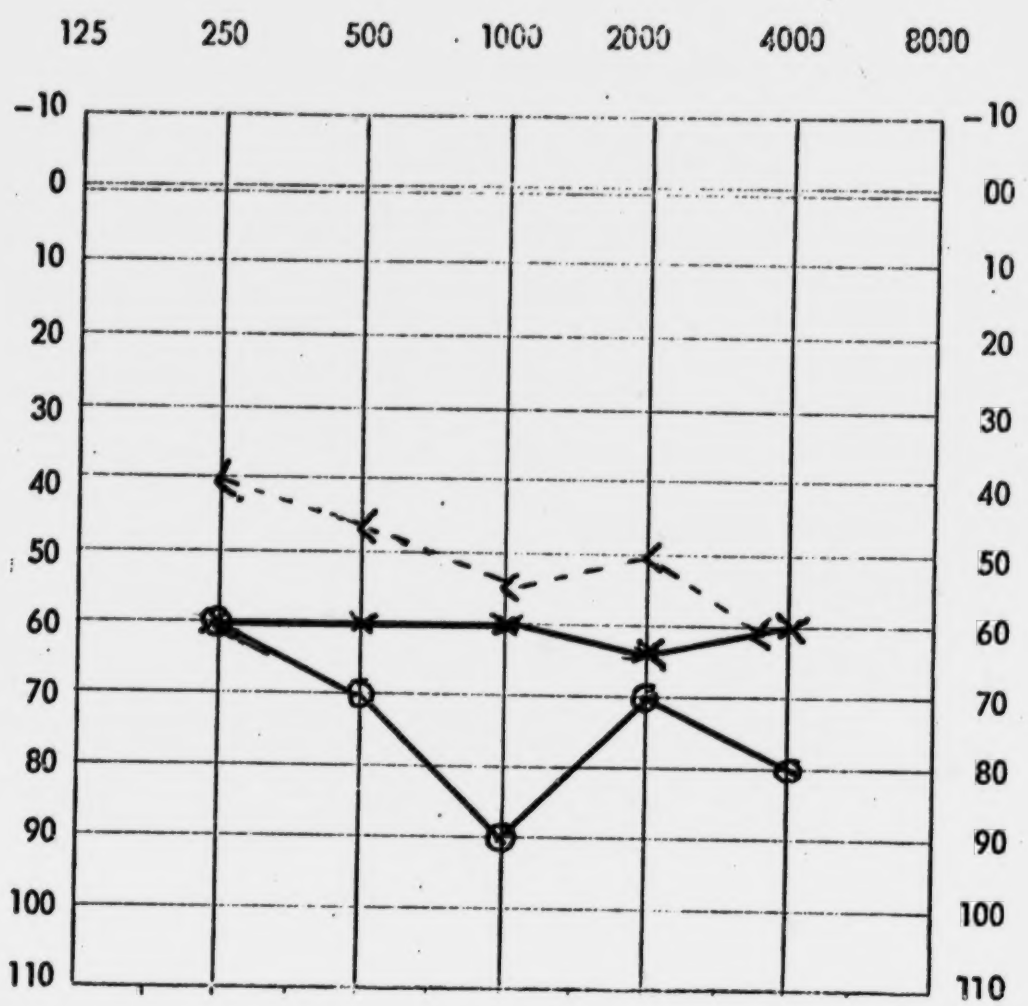
Thus, direct and continuous recording of listening in these children demonstrated that residual hearing and a year or two of specialized training is no guarantee that the child will consistently make use of his listening ability.

MIKE



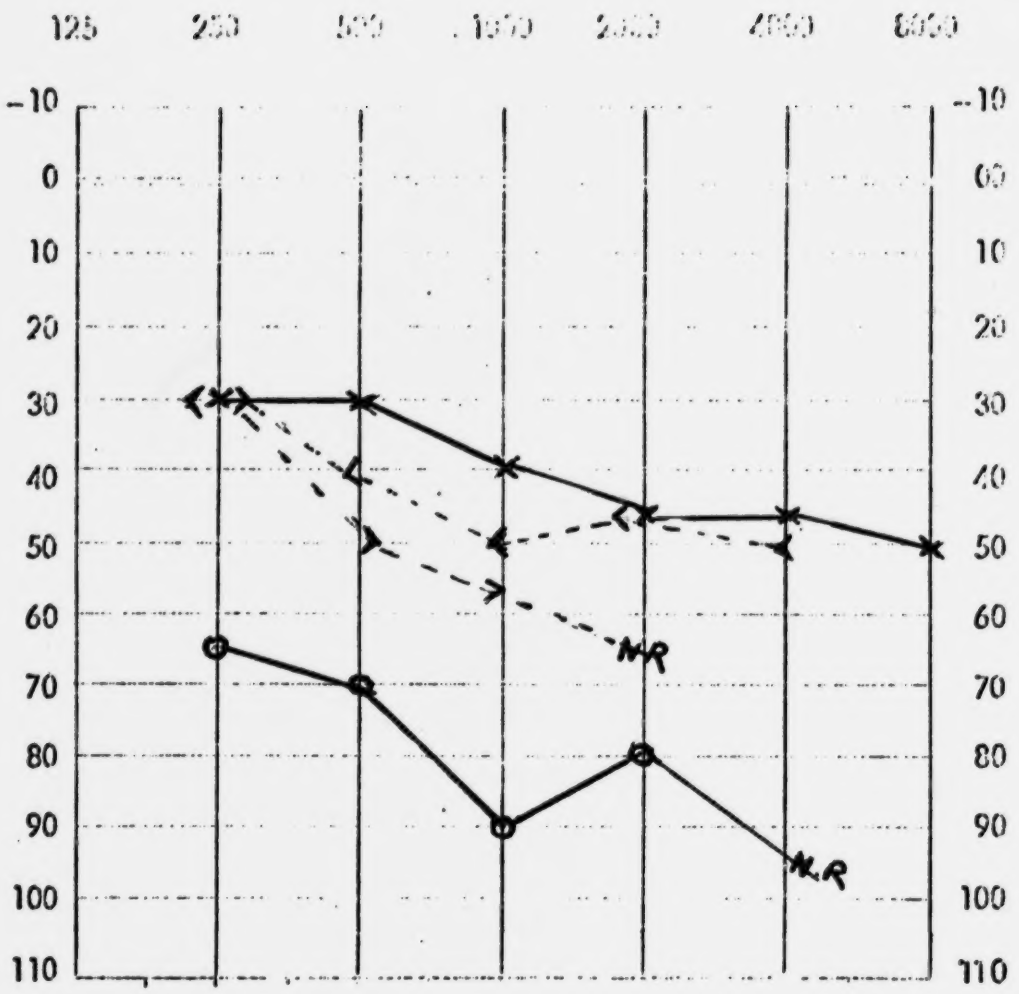
ASA Standards

CATHY



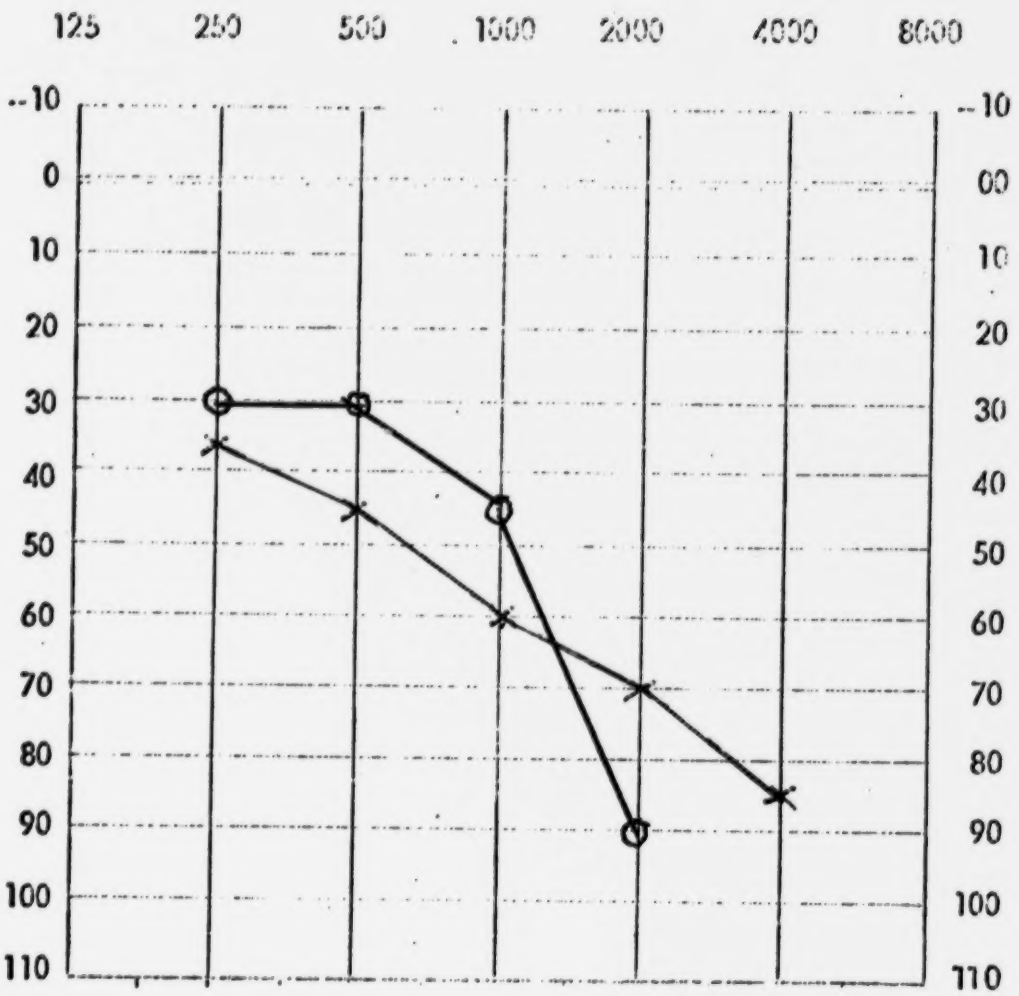
ASA Standards

SHERYL



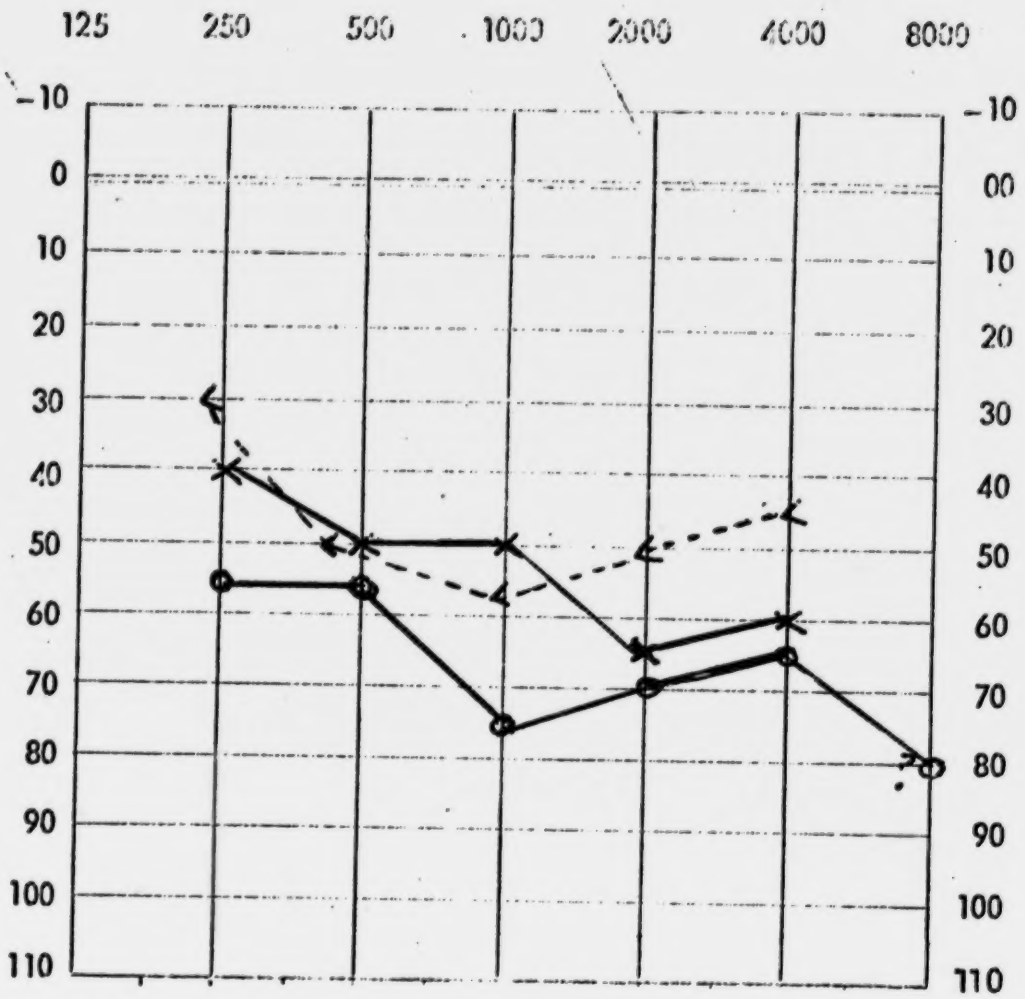
ASA Standards

JOY



ASA Standards

PAUL



ASA Standards